

# Summary of Preliminary Findings: CORMIX Modeling of City of Sandpoint Discharge

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## Assuming Uniform Ambient Velocity in the Downstream Direction

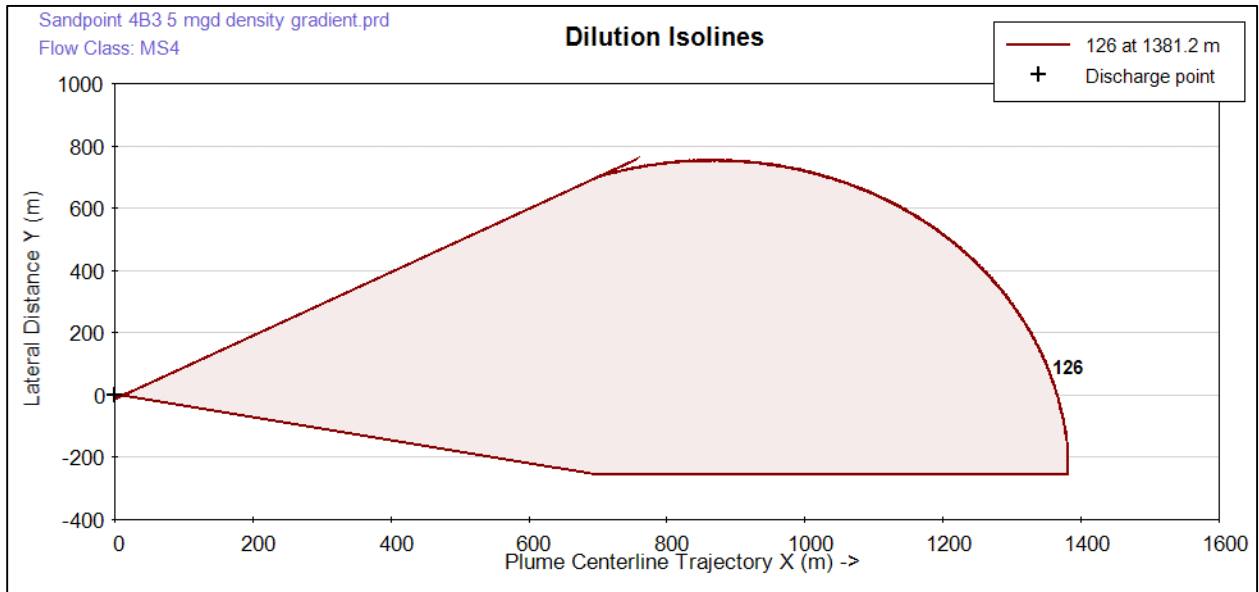
- Predictions for flow rates lower than the 4B3, which is 4480 CFS (an acceptable alternative to the 7Q10, for chronic aquatic life criteria) produced questionable results, including very large upstream intrusions and very long plume travel times to reach the end of the hydrodynamic near field. Thus, predictions for both the acute and chronic (except ammonia) mixing zones used the 4B3 ambient flow rate instead of the 1Q10 and 7Q10.
- Limiting the acute mixing zone to less than 15 minutes (900 seconds or 0.25 hours) of plume travel time, as recommended in the *Technical Support Document for Water Quality-based Toxics Control* for low-velocity discharges, results in an acute dilution factor of about 30:1, or a mixing zone of about 9-10% of the 1Q10 stream flow (see Figure 2). Compare this to an acute mixing zone of 25% of the 1Q10, which provides a dilution factor of 79:1.
- Ensuring that the mixing zones for chronic ammonia (30B3 flow rate) and for human health criteria for non-carcinogens (e.g., arsenic, 30Q5 flow rate) and carcinogens (harmonic mean flow rate) does not extend to the Albeni Falls Dam (27 miles or 43 km downstream) requires a mixing zone smaller than 25% of the stream flow. A mixing zone of 20% of the appropriate critical flows would avoid this outcome (see Figures [3](#), [4](#) and [52](#)).
- Ensuring that the mixing zone for chronic ammonia (30B3 flow rate) does not exceed 25% of the width of the river requires a mixing zone no larger than about 15% of the stream flow (see Figure 3). The river is 9600 ft wide at the point of discharge; 25% of this is 2,400 feet or 732 meters.
- Ensuring that the mixing zone for human health criteria for non-carcinogens (3Q5 flow rate) does not exceed 25% of the width of the river requires a mixing zone no larger than about 15% of the stream flow (see Figure 4).

## Using 0.2 ft/s Ambient Velocity at North 18° East

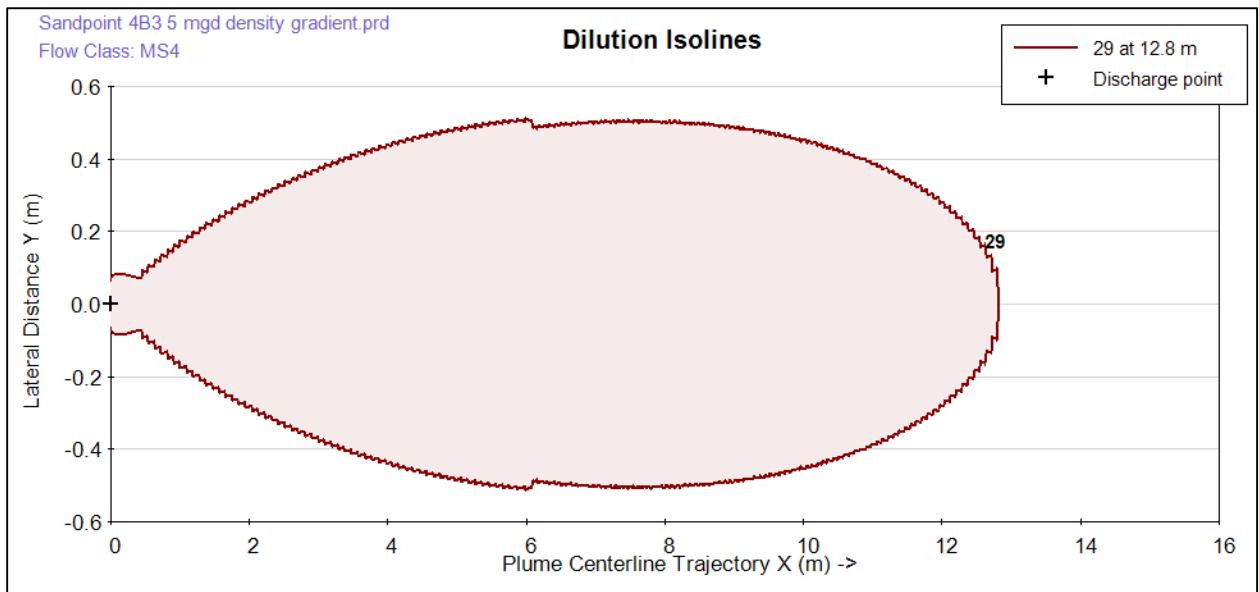
- This is the low end of the ambient velocity and the surface direction measured by Bob Steed on 8/3/15. The direction at 80% depth was undetermined.
- Under these conditions, the ambient velocity would push the plume toward the shore and then toward the spit at the north end of the “long bridge.”
- Limiting the acute mixing zone to less than 15 minutes (900 seconds or 0.25 hours) of plume travel time results in an acute dilution factor of about 45:1, or a mixing zone of about 14% of the 1Q10 stream flow. This occurs about 22.5 meters from the outfall, which is close enough that “downstream” (or downwind) boundaries that violate the model assumptions should not invalidate the results.
- The end of the hydrodynamic near field is 40 meters “downstream,” at which point the dilution factor is 59:1. Subsequent mixing is passive and occurs slowly.

- The dilution at 20 meters “downstream” is 42:1, compared to about 30:1 for uniform downstream flow, at the 4B3 flow rate. Thus, near-field mixing appears to occur more rapidly under this scenario than under the uniform ambient velocity scenarios.
- The fate of the plume in the hydrodynamic far field is unknown.

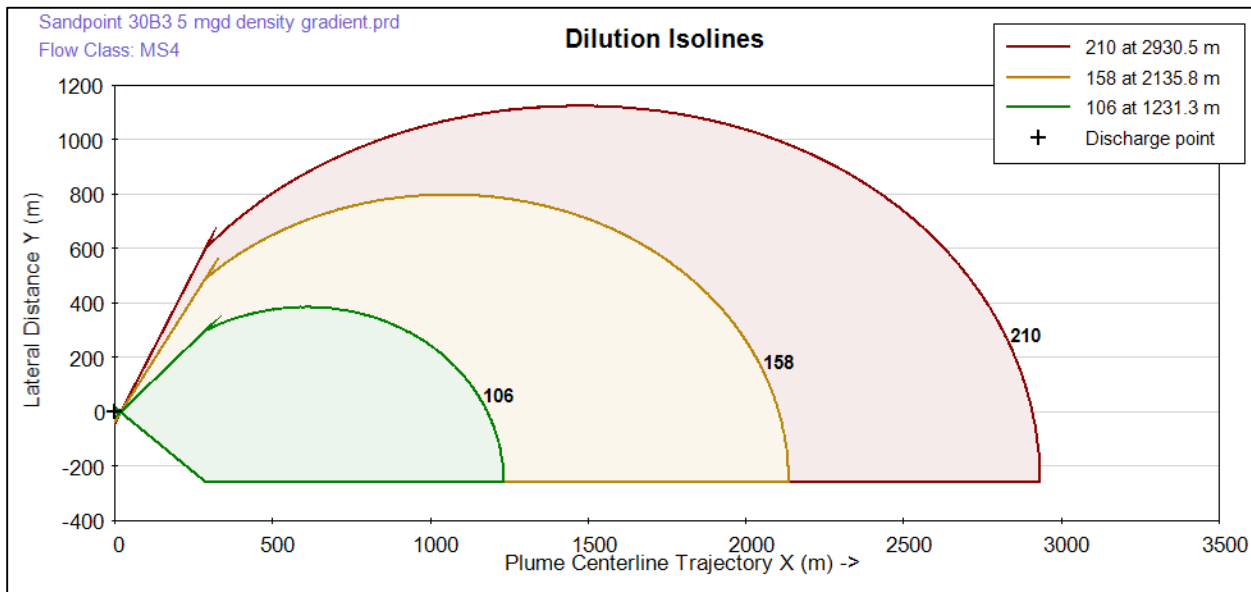
**Figure 1: Dilution isoline for a 25% chronic mixing zone (126:1) at the 4B3 flow rate.**



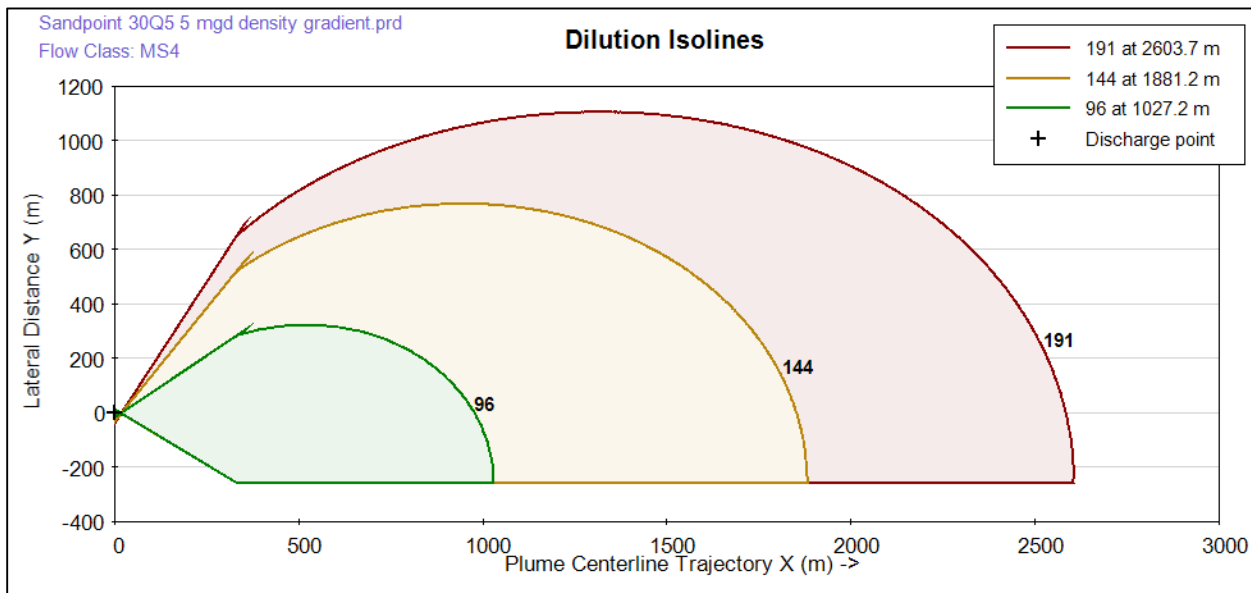
**Figure 2: Dilution isoline for a 9% acute mixing zone (29:1) at the 4B3 flow rate.**



**Figure 3: Dilution isolines for 20% (210:1), 15% (158:1), and 10% (106:1) mixing zones at the 30B3 flow rate.**



**Figure 4: Dilution isolines for 20% (191:1), 15% (144:1), and 10% (96:1) mixing zones at the 30Q5 flow rate.**



**Figure 5: Dilution isolines for 20% (435:1), 15% (327:1), and 10% (218:1) mixing zones at the harmonic mean flow rate.**

